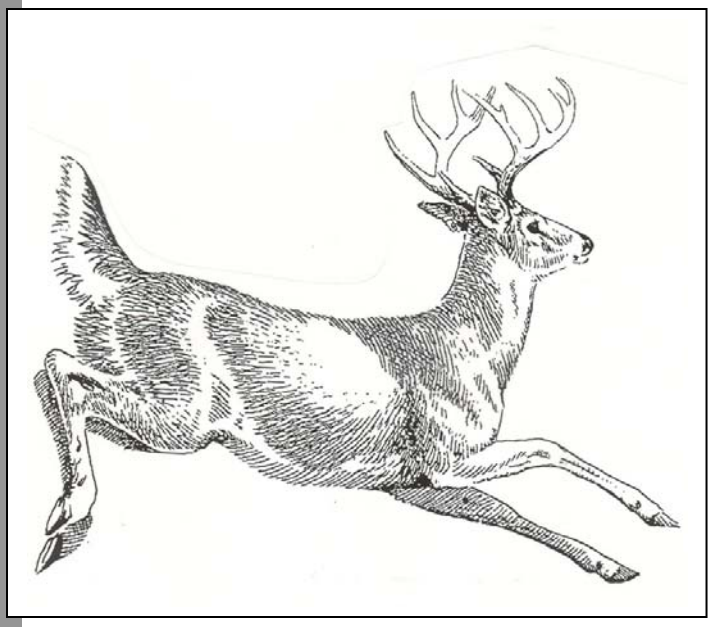
Participation in and Orientation of Wildlife Professionals toward Consumptive Wildlife Use: A Resurvey



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EXECUTIVE SUMMARY

Hunting has been integral to the development of wildlife conservation programs and the wildlife profession. In large part, funding for professional wildlife positions has been derived from fees and excise taxes paid by hunters. Further, prior involvement with hunting and fishing were important influences for those who entered the wildlife profession.

Given the historic linkage between the wildlife profession and hunting, when juxtaposed with today's broadened agency mandates, an increasing number of stakeholders in wildlife management, and an aging professional work force, some in the profession have wondered what these trends portend for the commitment of wildlife professionals to hunting programs in the future. This study was designed to shed light on this general question.

OBJECTIVES

The primary objectives of this study were to determine (1) whether the levels of participation of wildlife professionals in consumptive and other wildlife activities has changed in recent years, and (2) whether attitudes and wildlife value orientations of wildlife professionals have changed. Previous studies available for comparison that were limited to wildlife professionals, Sanborn (1995) and Brown et al. (1994), used samples of TWS members. Available funding for this study permitted enlarging the sample to include separate strata of wildlife professionals who work for state agencies and those who work for federal agencies. Thus, a secondary objective was to compare the wildlife value orientation and wildlife recreation participation traits of state agency employees and federal employees, regardless of TWS membership, with TWS members.

METHODS

The electronic mailing list of names and addresses of TWS members was sampled for the study. In addition, leaders of federal and state wildlife agencies provided names and addresses of wildlife professionals employed in their agencies. Cooperators from federal agencies included the Fish and Wildlife Service, USGS, USDA APHIS, BLM, Forest Service, and NRCS. Twenty state wildlife agencies also provided rosters of employees for the study. These states were well distributed geographically, representing all regions of the US. Cooperating organizations generally provided entire rosters of wildlife or wildlife and fisheries agency staff. From these lists we chose titles reflecting wildlife managers, biologists, and researchers.

A random sample of 750 TWS members was drawn for the survey. Systematic samples of 973 federal employees and 704 state employees were also selected. The mail survey was launched on October 19, 2004. We used a standard procedure of mailing up to 3 reminder notices to encourage participation in the survey.

To facilitate assessment of participation in wildlife activities and to compare the results of this study and a 1994 study (Sanborn 1995), we used comparable wording: "In which of the following recreational activities do you engage during a typical year?" For comparability of attitudes and wildlife value orientation, we compared the results of this study with those of the

1991 Cornell study (Brown et al. 1994). We used the same wording for all attitude statements that were included, but selected the subset of statements that factored into dimensions important to this study.

We used principal components analysis with varimax rotation to form factors that describe the wildlife value orientations. Cronbach's Alpha was used to measure the internal consistency of items composing each factor. Groupings of professional wildlife employees were then derived using cluster analysis with Wards method and squared Euclidian distances. The variables in the cluster analysis were mean scores for each factor.

Changes in wildlife-associated recreation participation were assessed using only the TWS stratum in 2004 because the previous data (1994) were from TWS members. We also present participation data from the two other strata of (1) federal and (2) state employees. These strata were formed by systematically selecting names of professional wildlife employees from the list we received from federal and state agencies. Thus, some but not all of these employees will be TWS members.

RESULTS

Of a total of 2,427 questionnaires mailed out, 47 were undeliverable and 1,848 were returned, for an adjusted return rate of 78%. Adjusted return rates by strata were 77% for TWS, 81% for state employees, and 74% for federal employees.

Participation in Wildlife Activities, 2004 and 1994

Participation by TWS members in 6 fish and wildlife activities could be compared between 1994 and 2004 (bolded in Table 1). The percentage of respondents participating was lower in 2004 than in 1994 for each activity, with statistically significant differences occurring for 4 of the 6 activities. Given the sample sizes of the two surveys, differences in participation of 6% were needed for statistical significance at $P \leq 0.05$ (χ^2, 1 df).

The 1994 to 2004 comparison for the 2 TWS strata indicates that over that 10-year period, somewhat fewer wildlife professionals participated in both small game and big game hunting, and substantially fewer participated in bait and lure fishing. However, the 2004 respondents also participated significantly less in nonconsumptive activities—bird watching and feeding wild animals or birds. Hiking and camping participation levels were similar for 2004 and 1994—slightly less in 2004 but the difference was not statistically significant.

The 2004 federal respondents were quite similar in their participation patterns to the TWS stratum. Participation levels were identical for big game hunting, and 4 percentage points higher for federal employees for small game hunting and bait/lure fishing, but these differences were not statistically significant. State employees, on the other hand, were far more active participants in each of the consumptive activities (statistically significant at $P \leq 0.05$ (χ^2, 1 df). .

Table 1. Recreational activities that respondents engage in during a typical year, 2004 and 1994.

	TWS Members		State and Federal Strata, 2004	
	2004	1994	State	Federal
Recreational activity	Percent Checked			
Big game hunting	50	54	79	50
Small game hunting	48	56*	78	52
Trapping	7	[a]	17	8
Bait fishing/ lure fishing	53	69*	78	57
Fly fishing	29	33	31	25
Birdwatching	77	86*	71	81
Feeding wild animals or birds	46	64*	51	47
Hiking	75	78	67	79
Camping	68	69	67	71

[a] Not covered in the 1994 survey

* Significant difference between 2004 and 1994 TWS members, χ^2, 1 df, $p<0.02$.

Wildlife Attitudes and Values Orientation

2004 and 1991 Comparison

In constructing the factors used in the comparison of wildlife value orientations, obtaining an acceptable reliability score (Cronbach's Alpha) required using a different combination of item statements in 2004 from 1991, which in turn required modifying the original 1991 analysis. This was done, and produced a 3-factor solution with an Alpha of 0.64 for 2004 data. We named the factors wildlife use, conservation, and ecological systems. The 10 items on wildlife use related to hunting and trapping, viewing wildlife as a renewable natural resource, and managing populations of wild animals. The 3 conservation items dealt with restricting human activities for the sake of wildlife, spending more resources to conserve wildlife, and doing more to conserve endangered and threatened wildlife. The 2 ecological systems items dealt with the priority of habitat conservation and maintaining viable wildlife populations versus caring for individual animals.

A comparison of responses to the individual items in the wildlife use factor between 1991 and 2004 TWS samples revealed no significant difference with respect to 9 of the 10 items (Table 2, in main body of report). A significant difference occurred with respect to one item, "Most people who participate in trapping feel compassion for wildlife." In 1991, 18.2% disagreed or strongly disagreed with this statement, compared to only 13.2% of 2004 respondents (χ^2=5.855, 1df, $P \leq 0.02$). Our analysis examined whether there was any significant shift in the number of respondents who agreed versus strongly agreed with the positively-worded wildlife use items, or disagreed versus strongly disagreed with negatively-worded items. While this was the case with respect to only the one item noted above, more 2004 than 1991 respondents "strongly agreed" versus "agreed" with positively-worded items, and "strongly

disagreed" versus "disagreed" with negatively-worded items. As a result, the overall mean for the 10 wildlife use elements, 4.40 in 2004, compared to 4.24 in 1991, is statistically significant ($t=6.53$, $df= 2,645$, $P \leq 0.05$).

Results of 2004 Clustering

No significant differences were found in attitudes of the TWS stratum versus the 2 strata of federal and state employees in 2004. Therefore, both to increase sample size and to include a broader representation of the wildlife profession, the combined data set was used in the cluster analysis. We chose a 6- cluster solution because there was a natural break in the agglomeration schedule and the clusters had significantly different means from each other for at least one of the factor variables.

The largest of the 6 clusters, 32.1% of respondents, scored very high on each of the wildlife use, conservation, and ecological systems factors (Table 3, main body of report). The proportions of this group who hunted big game and who participated in bird watching were greater than those for all respondents. Respondents in the second largest cluster (23.6%) had the highest scores on wildlife use and moderately high scores on the conservation and ecological use factors. This group had a high proportion of big game hunters (78.3%) but the second lowest proportion of birdwatchers (65.0%). It had the highest proportion of males (90.4%) and the least proportion of federal employees (44.4%).

The third largest cluster, 22.0% of respondents, scored very high on the conservation factor and moderately high on the wildlife use and ecological systems factors. Of the 3 largest clusters that together include 77.7% of respondents, this group contained the most women (37.7%), the fewest big game hunters (29.4%), and the most birdwatchers (84.7%). Overall, women had a mean score on the wildlife use factor of 4.00, which is moderately high, but significantly lower than the mean score of 4.52 for men ($t=13.137$, $525df$, $P \leq 0.01$).

The fourth largest group, 13.9% or respondents, scored very high on the wildlife use and conservation factors, and lowest on the ecological systems factor. Their participation in big game hunting and wildlife photograph was above average. The fifth largest cluster, with 87 respondents (4.7%), scored very high on the wildlife use factor, moderately high on the ecological systems factor, and neutral on the conservation factor. This cluster had the highest proportion of big game hunters (but not statistically different from Cluster 2) and the lowest proportion of birdwatchers.

The smallest cluster, with only 3.7% of respondents, scored moderately low (below neutral) on the wildlife use factor, very high on the conservation factor, and moderately high on the ecological systems factor. The majority of these respondents (58.7%) were women. Only 14.7% hunted big game, but above average numbers were birdwatchers (83.8%) and wildlife photographers (57.4%).

We also examined the hypothesis that younger members of the wildlife profession have wildlife use orientations that are less strong than those of older members of the profession. This

was done by comparing a simple dichotomy of those who had been members of the profession for 10 years or less versus those who had been in the profession for a longer period. About 25% of both state and federal agency respondents had been the wildlife profession 10 years or less, compared to one-third of respondents from the TWS stratum.

For each stratum—TWS, state agency employees, and federal agency employees, the overall mean score for the wildlife use factor was statistically less positive ($P \leq 0.001$) for newer wildlife employees than for those who had been in the profession more than 10 years (Table 4). However, the difference between these mean scores is too small to ascribe much real significance. For scale items worded positively about some aspect of hunting or wildlife use, 4.0 would indicate "agree" and 5.0, "strongly agree." Thus, a difference of 0.2 point would still indicate a similar level of overall support—agreement or a positive response to the wildlife use factor. Greater difference was found between the 3 strata than between the number of years in the profession on the wildlife use factor scores.

Table 4. Mean scores on the wildlife use factor by years in the profession, 2004.

	Mean score, standard deviation, and *N* Years in Wildlife Profession			
Stratum	10 or less	Over 10	*t* value	*P*-value
TWS	4.15 (0.70) *N*=189	4.35 (0.68) *N*=367	3.25	0.001
State agency	4.51 (0.49) *N*=143	4.69 (0.46) *N*=418	3.97	0.000
Federal agency	4.18 (0.70) *N*=177	4.36 (0.61) *N*=512	3.25	0.001

DISCUSSION

Participation rates in hunting among the general public have declined notably since 1980. Among wildlife professionals (TWS members), the decline from 1994 to 2004 was statistically significant for small game hunting and also for bait/lure fishing, but not for big game hunting. Declines also occurred in some nonconsumptive activities. Thus these limited data may be revealing less participation in wildlife activities generally, not exclusively a change in orientation away from consumptive activities.

This perspective is further supported by the wildlife orientation data. Comparisons of scores to 9 of the 10 items in the wildlife use factor revealed no significant difference between

1991 and 2004 respondents. For the one item with a significant difference, fewer respondents in 2004 than in 1991 disagreed with the statement "Most people who participate in trapping feel compassion for wildlife." Moreover, the overall mean score on the wildlife use factor in 2004 was higher than in 1991 with statistical significance. The difference between the 2 scores, 4.40 in 2004 vs. 4.24 in 1991, is statistically significant primarily because of large sample sizes. Thus, the overall results are convincing that there has been no erosion in attitudes toward wildlife use across all TWS members over the period of the 2 studies.

A further current (2004) comparison of wildlife professionals by number of years in the profession shows that those in the profession for 10 years or less have scores on the wildlife use factor that are lower than those of other professionals with very high statistical probability. However, in terms of any practical meaning, those scores are only slightly lower, and are still at a level that shows a solid orientation toward consumptive wildlife use for most members of the profession. It is too early to know whether these two points in time represent the early stage of a trend. We suggest that this study be repeated approximately 10 years hence.

The cluster analysis shows that of the 6 clusters formed with respect to the 3 factors (wildlife use, conservation, ecological systems), the 2 largest clusters have very high mean scores on the wildlife use factor (above 4.5). The third factor (with 22% of respondents) was only moderately high (3.79), and the smallest cluster (3.7%) was slightly negative (2.55, where 3.0 is neutral).

Wildlife managers have a substantial challenge in serving a diverse spectrum of stakeholders. Among them are traditional stakeholder groups of sportsmen and sportswomen. These people support state agencies financially and are among the most interested and hardest working groups for wildlife conservation. Thus, they remain an important, if declining, set of stakeholders for management. While it is likely that agencies will be successful in the future only if they embrace segments of the public who have other wildlife interests, whether positive interest in nonconsumptive activities or concerns about wildlife damage and disease aspects, continuing commitment to consumptive use stakeholders will be necessary. Wildlife agency managers and administrators concerned about sustaining such agency commitment in the face of significant attrition of senior staff may be relieved by results of this study. Our findings suggest that the various attempts of agencies to meet the needs of other stakeholders have not resulted in any significant change in orientation away from the needs of sportsmen and sportswomen.

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Mailings and data entry were handled by Karlene Smith, Mohamad Sy-Ar, and Elizabeth Dawson of the Human Dimensions Research Unit (HDRU). Margie Peech of HDRU handled formatting of the final report.

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INTRODUCTION

Hunting has been integral to the development of wildlife conservation programs and the wildlife profession. Organ and Fritzell (2000) documented this assertion by chronicling the important roles of sportsmen in putting an end to commercial traffic in wildlife, establishing state and federal control over wildlife use, and supporting the development of professional game management and the wildlife management professions. In large part, funding for professional wildlife positions has been derived from fees and excise taxes paid by hunters. Further, prior involvement with hunting and fishing were important influences for those who entered the wildlife profession (Angus 1995).

Since the 1970s, agency mandates have broadened from game management to protection of non-game species and their habitats. As a result of this and other forces in which larger segments of the public sought an active voice in natural resources policy and management, the number of stakeholders broadened from hunters and rural landowners (who typically hunted) to include many other groups, some of whom were not traditional clientele of state wildlife agencies (Decker et al. 1996). This broadening of agency attention also brought new people into the wildlife profession who were not influenced primarily by hunting and fishing (Muth 1991).

Concurrent to the above trends, the governmental work force has been aging in the U.S., with over 40% of its members beyond the age of 50 (Renewable Natural Resources Foundation 2003-04). Federal natural resource agencies are having high numbers of retirements currently, with even higher numbers of employees in leadership positions eligible for retirement within the next few years. In management, law enforcement, and information and education programs of state fish and wildlife agencies, 46% of employees in leadership positions and 27% of all employees will retire between mid-2004 and 2010 (McMullin 2004).

Because of the historical linkage between the wildlife profession and hunting, some in the profession have wondered what the static to declining trend in hunting participation combined with aging of today's agency workforces portend for the future of the wildlife profession with respect to commitment to hunting programs. Participation in hunting among the general public has fallen from 17.4 million in 1980 (10% of the population) to 13.0 million (6% of the population) in 2001 (U.S. Fish and Wildlife Service 1982, 2001). Several studies have examined attitudes of the public toward hunting. Most Americans appear to support legal hunting, although evidence exists that degree of support is related to the perceived motivations of hunters. For example, Kellert (1978) found that 80% of American households approve of hunting to put meat on the table, but 60% did not approve of hunting for sport or recreation. More recently, 73% of Americans indicated strong or moderate approval of legal hunting in 1995 (Responsive Management 1995).

Studies of attitudes and orientations of wildlife professionals toward consumptive uses of wildlife are rare and no repeated studies are available to provide an indication of trends. Muth et al. (1998) surveyed attitudes and values of members of The Wildlife Society, Society for Conservation Biology, American Fisheries Society, and North American Wildlife Enforcement Association. About half (49.4%) of this combined group were hunters, and only 52.5% agreed

with the statement "Wildlife and fish species are resources to be harvested in a sustainable way and used for human benefit."

Sanborn (1995) surveyed a sample of members of The Wildlife Society for insight into their culture and worldview. She used cluster analyses and from her data developed 3 non-exclusive worldviews of her respondents. Briefly, those with utilitarian orientations gave priority to hunters and anglers in management decisions and were neutral as to whether scientific priority should take precedence over funding for management initiatives. Those with a scientistic outlook were neutral to the concept of equality among constituency groups, but rejected giving hunters and anglers priority. They also believed that science should drive the decision-making process. Those with an egalitarian perspective saw all stakeholder groups as being equal and were neutral about giving hunters and anglers priority in managememt decisions. They generally believed that biology rather than interests of funding sources should drive management decisions. Each of these groups believed public input to management to be important. With 402 respondents, 41% were classified as utilitarian, 34% as scientistic, and 26% as egalitarian.

In a 1991 survey of The Wildlife Society (TWS) members, Brown et al. (1994) developed a wildlife paradigm scale of 14 items, from which 3 factors emerged: (1) wildlife use, which dealt with hunting, trapping, use of wildlife for food, and human domination over wildlife; (2) pain and suffering, which dealt with the extent to which the pain and suffering of individual wild animals should affect the management of wildlife activities and programs; and (3) ecological systems, which dealt with the emphasis that should be placed on wildlife populations and their habitats versus individual animals. Respondents were sufficiently similar in their orientation that in a 6-cluster model, 83% of respondents fell within a single cluster. When expanded to an 8-cluster model to provide additional diversity, the largest cluster (53.4%) scored very positively on the wildlife use and ecological systems factors and positively on the pain and suffering factor. Respondents in the second cluster (29.8%) scored positively on each of the 3 factors. The third largest group (10.2%) scored positively on the ecological systems factor and neutral on the pain and suffering and ecological systems factors. Of the 5 remaining clusters totaling 6.5% of respondents, in only one cluster (0.4%) did respondents score negatively on the wildlife use factor, while in a second cluster (0.5%), the mean score was in the neutral range.

OBJECTIVES

The primary objectives of this study were to determine (1) whether the levels of participation of wildlife professionals in consumptive and other wildlife activities has changed in recent years, and (2) whether attitudes and wildlife value orientations of wildlife professionals have changed. Previous studies available for comparison that were limited to wildlife professionals, Sanborn (1995) and Brown et al. (1994), used samples of TWS members. Available funding for this study permitted enlarging the sample to include separate strata of wildlife professionals who work for state agencies and those who work for federal agencies. Thus, a secondary objective was to compare the wildlife value orientation and wildlife recreation participation traits of state agency employees and federal employees, regardless of TWS membership, with TWS members.

METHODS

The electronic mailing list of names and addresses of TWS members was sampled for the study. In addition, leaders of federal and state wildlife agencies provided names and addresses of wildlife professionals employed in their agencies. Cooperators from federal agencies included the Fish and Wildlife Service, USGS, USDA APHIS, BLM, Forest Service, and NRCS. Twenty state wildlife agencies also provided rosters of employees for the study. These states were well distributed geographically, representing all regions of the US. Cooperating organizations generally provided entire rosters of wildlife or wildlife and fisheries agency staff. From these lists we chose titles reflecting wildlife managers, biologists, and researchers.

A random sample of 750 TWS members was drawn for the survey. Systematic samples of 973 federal employees and 704 state employees were also selected. The timing of receipt of names and addresses contributed to the larger sample of federal employees (we had already chosen a sampling fraction and had drawn much of the sample when the lists arrived from two of the federal agencies). The primary sampling criteria was that with an anticipated response rate of at least 55%, we obtain at least 384 responses from each stratum, the minimum number needed for a margin of error of +/- 5% at the 95% confidence level.

The Cornell University Committee on Human Subjects approved the survey design. The mail survey was launched on October 19, 2004. We used a standard procedure of mailing up to 3 reminder notices to encourage participation in the survey (Dillman 2000).

To facilitate assessment of participation in wildlife activities and to compare the results of this study and a 1994 study (Sanborn 1995), we used comparable wording: “In which of the following recreational activities do you engage during a typical year?” For comparability of attitudes and wildlife value orientation, we compared the results of this study with those of the 1991 Cornell study (Brown et al. 1994). We used the same wording for all attitude statements that were included, but selected the subset of statements that factored into dimensions important to this study.

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RESULTS

Of a total of 2,427 questionnaires mailed out, 47 were undeliverable and 1,848 were returned, for an adjusted return rate of 78%. Adjusted return rates by strata were 77% for TWS, 81% for state employees, and 74% for federal employees.

Most respondents from the TWS stratum (members of the parent Society) were also members of chapters (62%) and sections (59%). Half of the respondents from the state employees stratum were TWS chapter members, 26% were section members, and 34% were TWS members. Fewer respondents from the federal employees stratum had these affiliations; 36% were chapter members, 22% were section members, and 28% were TWS members.

Participation in Wildlife Activities, 2004 and 1994

Participation by TWS members in 6 fish and wildlife activities (bolded in Table 1) could be compared between 1994 and 2004. The percentage of respondents participating was lower in 2004 than in 1994 for each activity, with statistically significant differences occurring for 4 of the 6 activities. Given the sample sizes of the two surveys, differences in participation of 6% were needed for statistical significance at $P \leq 0.05$ (χ^2, 1 df).

The 1994 to 2004 comparison for the 2 TWS strata indicates that over that 10-year period, somewhat fewer wildlife professionals participated in both small game and big game hunting, and substantially fewer participated in bait and lure fishing. However, the 2004 respondents also participated significantly less in nonconsumptive activities—bird watching and feeding wild animals or birds. Hiking and camping participation levels were similar for 2004 and 1994—slightly less in 2004 but the difference was not statistically significant.

Table 1. Recreational activities that respondents engage in during a typical year, 2004 and 1994.

	TWS Members		State and Federal Strata, 2004	
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* Significant difference between 2004 and 1994 TWS members, χ^2, 1 df, $p<0.02$.

The 2004 federal respondents were quite similar in their participation patterns to the TWS stratum. Participation levels were identical for big game hunting, and 4 percentage points higher for federal employees for small game hunting and bait/lure fishing, but these differences were not statistically significant. State employees, on the other hand, were far more active participants in each of the consumptive activities (statistically significant at $P \leq 0.05$ (χ^2, 1 df).

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A comparison of responses to the individual items in the wildlife use factor between 1991 and 2004 TWS samples revealed no significant difference with respect to 9 of the 10 items (Table 2). A significant difference occurred with respect to one item, "Most people who participate in trapping feel compassion for wildlife." In 1991, 18.2% disagreed or strongly disagreed with this statement, compared to only 13.2% of 2004 respondents (χ^2=5.855, 1df, $P \leq 0.02$). Our analysis examined whether there was any significant shift in the number of respondents who agreed versus strongly agreed with the positively-worded wildlife use items, or disagreed versus strongly disagreed with negatively-worded items. While this was the case with respect to only the one item noted above, more 2004 than 1991 respondents "strongly agreed" versus "agreed" with positively-worded items, and "strongly disagreed" versus "disagreed" with negatively-worded items. As a result, the overall mean for the 10 wildlife use elements, 4.40 in 2004, compared to 4.24 in 1991, is statistically significant (t=6.53, df= 2,645, $P \leq 0.05$).

No significant differences were found between 1991 and 2004 respondents' answers to the 2 items that constitute the ecological systems factor. Of the 3 items included in the conservation factor, a significant difference was found in response to the item "Society should expend more resources to conserve threatened and endangered species." In 1991, 6.6% disagreed with this statement, compared to just 3.5% in 2004 (χ^2=5.855, 1df, $P \leq 0.02$).

Table 2. Respondents' extent of agreement to attitude statements within wildlife use, ecological systems, and conservation factors.

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
			Percent		
Wildlife Use					
Killing wild animals to sell their fur is morally wrong					
2004	7.5	11.0	18.4	31.7	31.3
1991	5.6	9.8	18.6	30.7	35.3
Hunting is morally wrong because it violates the right of an individual animal to exist					
2004	1.1	1.2	6.7	29.3	61.8
1991	0.6	0.7	8.0	29.2	61.5
Hunting is justified only when it is necessary to sustain human life					
2004	0.7	2.8	7.2	34.6	54.7
1991	0.6	1.1	7.6	33.3	57.4
It is wrong to regard wild animals as a renewable source of food					
2004	2.3	3.9	6.8	36.4	50.6
1991	0.9	4.0	6.4	36.7	52.0
It is ethical for humans to manage populations of wild animals					
2004	70.4	25.5	3.7	0.2	0.2
1991	63.6	32.5	3.3	0.5	0.1
An important step in preserving wildlife species is to protect them from all forms of hunting					
2004	0.9	3.2	3.7	27.3	65.0
1991	0.5	2.2	5.6	24.1	67.4
Most people who participate in trapping feel compassion for wildlife					
2004	13.4	33.2	40.2	10.2	3.0[1]
1991	10.4	30.5	40.9	13.8	4.4
Using wildlife for food is a natural part of human existence					
2004	47.4	43.0	7.0	1.9	0.7[1]
1991	36.3	44.8	14.2	3.4	1.4

Table 2, Continued.

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
			Percent		
Using wildlife gives society a vested interest in the long-term conservation of wildlife					
2004	35.9	48.0	10.9	3.3	1.9
1991	35.4	49.5	10.3	3.4	1.4
It is possible to view wildlife with reverence and still participate in hunting					
2004	70.2	24.0	2.5	1.9	1.4
1991	66.6	28.6	2.0	1.4	1.4
Ecological Systems					
The resources society expends to care for individual animals in non-threatened populations would be better spent on conservation of habitat used by those populations					
2004	42.4	43.3	11.3	2.1	0.9
1991	50.1	37.9	10.0	1.6	0.4
The perpetuation of wildlife populations is more important than the welfare of individuals in non-threatened populations					
2004	44.8	40.0	11.5	2.8	0.9
1991	46.9	37.3	10.9	4.5	0.3
Conservation					
It is ethical for society to restrict human activities to minimize negative impacts on wildlife					
2004	69.1	26.3	2.8	0.9	0.9
1991	66.1	29.9	2.7	1.0	0.2
Society should expend more resources to conserve threatened and endangered wildlife					
2004	47.0	40.0	9.4	2.6	0.9[1]
1991	38.3	41.7	13.4	6.2	0.4
People are not doing enough to conserve the natural systems that wildlife depend on for survival					
2004	62.2	27.8	6.5	3.3	0.2
1991	58.8	34.3	2.7	3.5	0.6

Results of 2004 Clustering

No significant differences were found in attitudes of the TWS stratum versus the 2 strata of federal and state employees in 2004. Therefore, both to increase sample size and to include a broader representation of the wildlife profession, the combined data set was used in the cluster analysis. We chose a 6- cluster solution because there was a natural break in the agglomeration schedule and the clusters had significantly different means from each other for at least one of the factor variables. Table 3 shows the factor means and other characteristics for each cluster. Factor means relate to a 5-point scale where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. Individual items have been recoded such that scores of 4 to 5 represent strongly favoring wildlife use, conservation, or ecological systems.

The largest of the 6 clusters, 32.1% of respondents, scored very high on each of the wildlife use, conservation, and ecological systems factors. The proportions of this group who hunted big game and who participated in bird watching were greater than those for all respondents. Respondents in the second largest cluster (23.6%) had the highest scores on wildlife use and moderately high scores on the conservation and ecological use factors. This group had a high proportion of big game hunters (78.3%) but the second lowest proportion of birdwatchers (65.0%). It had the highest proportion of males (90.4%) and the least proportion of federal employees (44.4%).

The third largest cluster, 22.0% of respondents, scored very high on the conservation factor and moderately high on the wildlife use and ecological systems factors. Of the 3 largest clusters that together include 77.7% of respondents, this group contained the most women (37.7%), the fewest big game hunters (29.4%), and the most birdwatchers (84.7%). Overall, women had a mean score on the wildlife use factor of 4.00, which is moderately high, but significantly lower than the mean score of 4.52 for men ($t=13.137$, 525df, $P \leq 0.01$).

The fourth largest group, 13.9% or respondents, scored very high on the wildlife use and conservation factors, and lowest on the ecological systems factor. Their participation in big game hunting and wildlife photograph was above average. The fifth largest cluster, with 87 respondents (4.7%), scored very high on the wildlife use factor, moderately high on the ecological systems factor, and neutral on the conservation factor. This cluster had the highest proportion of big game hunters (but not statistically different from Cluster 2) and the lowest proportion of birdwatchers.

The smallest cluster, with only 3.7% of respondents, scored moderately low (below neutral) on the wildlife use factor, very high on the conservation factor, and moderately high on the ecological systems factor. The majority of these respondents (58.7%) were women. Only 14.7% hunted big game, but above average numbers were birdwatchers (83.8%) and wildlife photographers (57.4%).

We also examined the hypothesis that younger members of the wildlife profession have wildlife use orientations that are less strong than those of older members of the profession. This

Table 3. Clustering results using three factor scores.

Characteristics	Clusters						Overall
	1	2	3	4	5	6	
n	592	434	405	255	87	68	1841
%	32.1	23.6	22.0	13.9	4.7	3.7	100.0
Wildlife Use (mean)[a]	4.57	4.80	3.79	4.72	4.67	2.55	4.40
Conservation (mean)[a]	4.83	3.87	4.60	4.45	3.08	4.78	4.42
Ecological Systems (mean)[a]	4.88	4.71	3.82	3.55	3.60	3.82	4.32
% of cluster who are TWS members	52.8	50.1	57.0	52.8	42.4	63.1	53.0
% who hunt big game	63.5	78.3	29.4	69.0	79.3	14.7	59.2
% who bird watch	81.4	65.0	84.7	75.3	57.5	83.8	76.4
% who photograph wildlife	42.9	32.9	54.3	50.6	47.1	57.4	44.9
% male	82.8	90.4	62.3	79.6	83.9	41.3	78.3

[a] Mean calculated based on a 5-point scale where 1 = a very negative orientation toward the factor, 3 = neutral, and 5 = a very positive orientation toward the factor.

was done by comparing a simple dichotomy of those who had been members of the profession for 10 years or less versus those who had been in the profession for a longer period. About 25% of both state and federal agency respondents had been the wildlife profession 10 years or less, compared to one-third of respondents from the TWS stratum.

For each stratum—TWS, state agency employees, and federal agency employees, the overall mean score for the wildlife use factor was statistically less positive ($P \leq 0.001$) for newer wildlife employees than for those who had been in the profession more than 10 years (Table 4). However, the difference between these mean scores is too small to ascribe much real significance. For scale items worded positively about some aspect of hunting or wildlife use, 4.0 would indicate "agree" and 5.0, "strongly agree." Thus, a difference of 0.2 point would still indicate a similar level of overall support—agreement or a positive response to the wildlife use factor.

Greater difference was found between the 3 strata than between the number of years in the profession on the wildlife use factor scores (Table 4). The mean response for state agency employees was significantly higher (>0.3 point) than for the TWS and federal agency strata, which were very similar. Again, there may not be a great deal of pragmatic difference between the strata on the wildlife use factor—each is generally positive. However, the mean score for the state agency group is beyond the midpoint (4.5) between "agree" and "strongly agree" for items worded positively, or between "disagree" and "strongly disagree" for items worded negatively regarding wildlife use.

Table 4. Mean scores on the wildlife use factor by years in the profession, 2004.

	Mean score, standard deviation, and *N* Years in Wildlife Profession			
Stratum	10 or less	Over 10	*t* value	*P*-value
TWS	4.15 (0.70) *N*=189	4.35 (0.68) *N*=367	3.25	0.001
State agency	4.51 (0.49) *N*=143	4.69 (0.46) *N*=418	3.97	0.000
Federal agency	4.18 (0.70) *N*=177	4.36 (0.61) *N*=512	3.25	0.001

DISCUSSION

Participation rates in hunting among the general public have declined notably since 1980. The sharpest decline occurred between 1980 and 1991, from 10.3% to 7.4% of Americans 16 years of age and older (U.S. Fish and Wildlife Service 1982, 1993). The participation rate declined further to 6.1% in 2001 (U.S. Fish and Wildlife Service 2001). The actual number of hunters declined from 17.4 million in 1980 to 14.1 million in 1991, and to 13.0 million in 2001. Among wildlife professionals (TWS members), the decline from 1994 to 2004 was statistically significant for small game hunting and also for bait/lure fishing, but not for big game hunting. Declines also occurred in some nonconsumptive activities. Thus these limited data may be revealing less participation in wildlife activities generally, not exclusively a change in orientation away from consumptive activities.

This perspective is further supported by the wildlife orientation data. Comparisons of scores to 9 of the 10 items in the wildlife use factor revealed no significant difference between 1991 and 2004 respondents. For the one item with a significant difference, fewer respondents in 2004 than in 1991 disagreed with the statement "Most people who participate in trapping feel compassion for wildlife." Moreover, the overall mean score on the wildlife use factor in 2004 was higher than in 1991 with statistical significance. The difference between the 2 scores, 4.40 in 2004 vs. 4.24 in 1991, is statistically significant primarily because of large sample sizes. Thus, the overall results are convincing that there has been no erosion in attitudes toward wildlife use across all TWS members over the period of the 2 studies.

A further current (2004) comparison of wildlife professionals by number of years in the profession shows that those in the profession for 10 years or less have scores on the wildlife use factor that are lower than those of other professionals with very high statistical probability. However, in terms of any practical meaning, those scores are only slightly lower, and are still at a level that shows a solid orientation toward consumptive wildlife use for most members of the profession. It is too early to know whether these two points in time represent the early stage of a trend. We suggest that this study be repeated approximately 10 years hence.

The cluster analysis shows that of the 6 clusters formed with respect to the 3 factors (wildlife use, conservation, ecological systems), the 2 largest clusters have very high mean scores on the wildlife use factor (above 4.5). The third factor (with 22% of respondents) was only moderately high (3.79), and the smallest cluster (3.7%) was slightly negative (2.55, where 3.0 is neutral).

While the overall 3-factor model has an acceptable reliability score, we realize that the ecological systems and conservation factors have too few items to make the claim that the items cover those domains well. We suggest that they be treated more as hypotheses or preliminary findings about the likely orientations of groupings of professional wildlifers in concert with a wildlife use scale with 10 items that we believe is adequate to represent that factor, which was the focus of this study.

Wildlife managers have a substantial challenge in serving a diverse spectrum of stakeholders. Among them are traditional stakeholder groups of sportsmen and sportswomen.

These people support state agencies financially and are among the most interested and hardest working groups for wildlife conservation. Thus, they remain an important, if declining, set of stakeholders for management. While it is likely that agencies will be successful in the future only if they embrace segments of the public who have other wildlife interests, whether positive interest in nonconsumptive activities or concerns about wildlife damage and disease aspects, continuing commitment to consumptive use stakeholders will be necessary. Wildlife agency managers and administrators concerned about sustaining such agency commitment in the face of significant attrition of senior staff may be relieved by results of this study. Our findings suggest that the various attempts of agencies to meet the needs of other stakeholders have not resulted in any significant change in orientation away from the needs of sportsmen and sportswomen.

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